

AMENDMENTS TO THE CLAIMS:

The listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) Method for diagnosing operating states of a synchronous pump in a liquid circuit, comprising the following steps:

at least one measurement step which measures an alternating voltage applied to a pump motor of the synchronous pump and an alternating current of the motor at different points in time to provide a plurality of recorded measured values corresponding to different points in time,

a determination step which:

determines an extent of a phase shift between the alternating voltage and the alternating current from the recorded measured values to provide a succession of phase shift values corresponding to successive points in time at different times from the recorded measured values,

determines the chronological progression of the phase shift from the succession of phase shaft values recorded measured values, and

determines a characteristic of the chronological progression, and

an assignment step which assigns the determined characteristic to a predetermined pump operating state in an assignment step.

2-4. (Canceled)

5. (Previously Presented) The method of claim 1, wherein the assignment step includes the step of assigning the determined characteristic to a predetermined characteristic value range linked to a pump operating state.

6. (Previously Presented) The method of claim 5, wherein:

the determination step includes the step of determining the extent of the slope of the chronological progression of the phase shift, and

the assignment step includes the step of assigning the determined extent of slope to a predetermined slope value range linked to a pump operating state.

7. (Previously Presented) The method of claim 1, wherein the determination step comprises a transformation step in which the chronological progression of the phase shift is subjected to a Fourier transform and the amplitude of the Fourier transform in a predetermined frequency range is determined, and

the following assignment step includes the step of assigning the determined amplitude to a predetermined amplitude value range linked to a pump operating state.

8. (Previously Presented) The method of claim 7, wherein the Fourier transform is one of the following:

a discrete Fourier transform (DFT) and
a fast Fourier transform (FFT).

9. (Previously Presented) The method of claim 1, wherein the determination of the chronological progression of the phase shift in the determination step includes the step of sliding averaging.

10. (Previously Presented) The method of claim 1, wherein the measurement step includes a conversion of the measured alternating voltage signal and of the measured alternating current signal into rectangular signals.

11. (Previously Presented) Device for carrying out the method according to claim 1, said device comprising a microcontroller including:

a timer,
a voltage inlet for recording a start signal,
a current inlet for recording a stop signal, said voltage and current inlets being constructed to interpret exceeding of a

predetermined voltage or current signal level as a start or stop signal, with a content of the timer being proportional to a chronological gap between the start signal and stop signal, and a memory for saving the timer content, said memory comprising a number of memory cells to save a sequence of memory contents.

12. (Canceled)

13. (Previously Presented) The device of claim 11, wherein the microcontroller comprises an evaluation unit for averaging the memory contents.

14. (Previously Presented) The device of claim 11, further comprising an interface for transmitting operating state-related data to a control unit for controlling the liquid circuit.

15. (Previously Presented) The method of claim 1, wherein the pump operating state is a low water level state.

16. (New) Method for diagnosing operating states of a synchronous pump in a liquid circuit, comprising the following steps:

at least one measurement step which measures an alternating voltage applied to a pump motor of the synchronous pump and an

alternating current of the motor at different points in time to provide a plurality of recorded measured values corresponding to different points in time,

a determination step which:

determines an extent of a phase shift between the alternating voltage and the alternating current from the recorded measured values to provide a succession of phase shift values corresponding to successive points in time,

stores the successive phase shift values in a number of memory cells,

determines the chronological progression of the phase shift from the succession of phase shift values stored in the successive memory cells, and

determines a characteristic of said chronological progression; and

an assignment step which assigns the determined characteristic to a predetermined pump operating state.